# BRUHAT BENGALURU MAHANAGARA PALIKE

2014

**Improvements to footpath & Asphalting to 3rd Cross, 8th Main, 9th Main, 10th Main Judicial Layout Allalasandra at Yelahanka Zone in Ward No.4**

## QUALITY CONTROL REPORT

## Client : Technical Manager, KRIDL, Bangalore.


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**ISO 9001 : 2008**

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**NABL ACCREDITED AS PER ISO/IEC 17025:2005**

Job No.: CECTC-RRN-TP-2014-15 **Date:** : 06.10.2014

## GRADATION FOR WMM
## MORTH TABLE-400-13

Client : **Executive Engineer,** Road Infrastructure RajaRajeshwari Nagara Division, BBMP, Bangalore.

Agency : **Technical Manager, KRIDL, Bangalore.**

Name of Work : Improvements to footpath & Asphalting to 3rd Cross, 8th Main, 9th Main, 10th Main Judicial Layout Allalasandra at Yelahanka Zone in Ward No.4

Date of Testing : 06.10.2014

Material : Wet Mix Macadam

Sample Location : WMM Mix Plant

Oven Dry Wt (gm): **13103**

| Is Sieve Size in mm | Weight Retained (gm) | Cumulative Weight Retained (gm) | Cumulative % of Retained | Cumulative % of Passing | Spec.Limits |
|---|---|---|---|---|---|
| 53 | 0 | 0 | 0 | 100 | 100 |
| 45 | 475 | 475 | 3.6 | 96.4 | 95-100 |
| 22.4 | 4720 | 5195 | 39.6 | 60.4 | 60-80 |
| 11.2 | 2310 | 7505 | 57.3 | 42.7 | 40-60 |
| 4.75 | 1895 | 9400 | 71.7 | 28.3 | 25-40 |
| 2.36 | 1345 | 10745 | 82.0 | 18.0 | 15-30 |
| 0.600 | 1298 | 12043 | 91.9 | 8.1 | 8-22 |
| 0.075 | 750 | 12793 | 97.6 | 2.4 | 0-8 |

**Note:**

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3. Any Query regarding the report must be reported within 15 days from the date of testing.

For CIVIL EXPERTS

Authorised Signatory

Assistant Executive Engineer
Road Infrastructures
Rajarajeshwari Nagar Division
Bruhat Bangalore Mahanagara Palike
Bangalore

# CVIL EXPERTS CONSULTANTS AND TESTING CENTER

JobNo: CECTC-RRN-TP-2014-15

Date : 06.10.2014

## DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

Client : **Executive Engineer,** Road Infrastructure RajaRajeshwari Nagara Division, BBMP, Bangalore.

Agency : **Technical Manager, KRIDL, Bangalore.**

Name of Work : Improvements to footpath & Asphalting to 3rd Cross, 8th Main, 9th Main, 10th Main Judicial Layout Allalasandra at Yelahanka Zone in Ward No.4

Technical Reference : IS 2386(Part 1) 1963 (RA 2007)

Type of Mix : Wet Mix Macadam

Date of Testing : 06.10.2014

| Passing through IS Sieve, mm | Retained On IS Sieve, mm | Weight of Sieved Fraction (W) gms | | Proportion of Size range in the sample, X = 100xW/ΣW | | Weight of 200 pieces of aggregates of the range, (P) in gms | | Thickness gauge size, mm | Weight of flaky particles (F)in gms | | Percentage by Weight of flaky aggregates in gms Y= 100xF/P | Weighed Percentage of flaky aggregates in gms XY=X × Y | Weight of fraction consisting of at least 200 Pieces in gms | | Length gauge size in mm | Weight of aggregates in each fraction retained on Length gauge in | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 63.00 | 50.00 | W1 | | X1 | | P1 | | 33.90 | F1 | | | | P1 | | - | E1 | |
| 50.00 | 40.00 | W2 | 2750 | X2 | 20.55 | P2 | 2625 | 27.00 | F2 | 415 | 15.81 | 324.81 | P2 | 2625.0 | 81.00 | E2 | 268 |
| 40.00 | 31.50 | W3 | 2635 | X3 | 19.69 | P3 | 2510 | 21.50 | F3 | 358 | 14.26 | 280.78 | P3 | 2510.0 | 64.40 | E3 | 239 |
| 31.50 | 25.00 | W4 | 2240 | X4 | 16.74 | P4 | 2180 | 16.95 | F4 | 275 | 12.61 | 211.11 | P4 | - | - | E4 | - |
| 25.00 | 20.00 | W5 | 1820 | X5 | 13.60 | P5 | 1720 | 13.50 | F5 | 250 | 14.53 | 197.64 | P5 | 1720.0 | 40.50 | E5 | 177 |
| 20.00 | 16.00 | W6 | 1480 | X6 | 11.06 | P6 | 1350 | 10.80 | F6 | 187 | 13.85 | 153.16 | P6 | 1350.0 | 32.40 | E6 | 161 |
| 16.00 | 12.50 | W7 | 1320 | X7 | 9.86 | P7 | 1290 | 8.55 | F7 | 96 | 7.44 | 73.39 | P7 | 1290.0 | 25.60 | E7 | 149 |
| 12.50 | 10.00 | W8 | 785 | X8 | 5.86 | P8 | 620 | 6.75 | F8 | 85 | 13.71 | 80.40 | P8 | 620.0 | 20.20 | E8 | 97 |
| 10.00 | 6.30 | W9 | 355 | X9 | 2.65 | P9 | 290 | 4.89 | F9 | 68 | 23.45 | 62.19 | P9 | 290.0 | 14.70 | E9 | 85 |
| | | **Σ W** | **13385.0** | | | | | | | | | **ΣXY 1383.49** | **ΣP** | **10405.0** | | **ΣE** | **1176.0** |

Result : Flakiness Index = **13.83%**

Elongation Index = **11.30%**

Result : Combined Flakiness & Elongation index **25.14%**

Comments: → Maximum Combined flakiness and Elongation indices value for Wet mix Macadam is 35%.

Note:

→ The results indicated above are based on the tests carried out on the samples received in the laboratory.

For CIVIL EXPERTS

Authorised Signatory

Executive Engineer
Road Infrastructures

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## NABL ACCREDITED AS PER ISO/IEC 17025:2005

Job No.: CECTC-RRN-TP-2014-15

Date: 07.10.2014

# TEST REPORT

| | | |
|---|---|---|
| **Client** | : | **Executive Engineer,** Road Infrastructure RajaRajeshwari Nagara Division, BBMP, Bangalore. |
| **Agency** | : | **Technical Manager, KRIDL, Bangalore.** |
| **Name of the work** | : | Improvements to footpath & Asphalting to 3rd Cross, 8th Main, 9th Main, 10th Main Judicial Layout Allalasandra at Yelahanka Zone in Ward No.4 |
| **Source of location** | : | Hot mix Plant, Bangalore |
| **Date of testing** | : | 07.10.2014 |

The results of the tests conducted on the bitumen sample using for Dense Graded Bituminous Macadam

| Sl. No | Description | Test Result | Requirement as per IS:73:2006 |
|---|---|---|---|
| 1 | Penetration at 25 $^0$C, 1/10 mm | 63 | 60 to 70 |
| 2 | Softening point, $^0$C | 50 | Min. 45 |
| 3 | Ductility at 27$^0$C, cm | 100 > | Min. 50 |
| 4 | Flash Point, $^0$C | 320 | Min. 220 |

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Job No.: CECTC-RRN-TP-2014-15 **Date:** 07.10.2014

### Aggregate Impact Value

IS: 2386 Part IV

| | |
|---|---|
| Client | **Executive Engineer,** Road Infrastructure RajaRajeshwari Nagara Division, BBMP, Bangalore. |
| Agency | **Technical Manager, KRIDL, Bangalore.** |
| Name of the Work | Improvements to footpath & Asphalting to 3rd Cross, 8th Main, 9th Main, 10th Main Judicial Layout Allalasandra at Yelahanka Zone in Ward No.4 |
| Source / Location | Hot mix Plant, Bangalore |
| Type of Mix | Dense Graded Bituminous Macadam |
| Date of Testing | 07.10.2014 |

| Sl No. | Details | Trial No. | | | Average |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | |
| 1 | Total weight of aggregate sample filling the cylindrical measure = $W_1$ g | 381 | 385 | 387 | |
| 2 | Weight of agregate passing 2.36 mm sieve after the test = $W_2$ g | 80 | 87 | 85 | |
| 3 | Weight of aggregate retained 2.36 mm sieve after the test = $W_3$ g | 301 | 298 | 302 | |
| 4 | Aggregate Impact value = percent fines | 21.00 | 22.60 | 21.96 | |
| | 100* ($W_2/W_1$)% | | | | **21.85** |

Comments:

→ Maximum allowable Aggregate Impact value for Dense Graded Bituminous Macadam is 27%

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# CIVIL EXPERTS CONSULTANTS AND TESTING CENTER

Job No.: CECTC-RRN-TP-2014-15

Date : 07.10.2014

## DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

Client : **Executive Engineer,** Road Infrastructure RajaRajeshwari Nagara Division, BBMP, Bangalore.

Agency : **Technical Manager, KRIDL, Bangalore.**

Name of Work : Improvements to footpath & Asphalting to 3rd Cross, 8th Main, 9th Main, 10th Main Judicial Layout Allalasandra at Yelahanka Zone in Ward No.4

Technical Reference : IS 2386(Part 1) 1963 (RA 2007)

Type of Mix : Dense Graded Bituminous Macadam

Date of Testing : 07.10.2014

| Passing through IS Sieve, mm | Retained On IS Sieve, mm | Weight of Sieved Fraction (W) gms | | Proportion of Size range in the sample, X = 100xW/ΣW | | Weight of 200 pieces of aggregates of the range, (P) in gms | | Thickness gauge size, mm | Weight of flaky particles (F)in gms | | Percentage by Weight of flaky aggregates in gms Y= 100xF/P | Weighed Percentage of flaky aggregates in gms XY=X × Y | Weight of fraction consisting of at least 200 Pieces in gms | | Length gauge size in mm | Weight of aggregates in each fraction retained on Length gauge in gms | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 63.00 | 50.00 | W1 | | X1 | | P1 | | 33.90 | F1 | | | | P1 | | - | E1 | |
| 50.00 | 40.00 | W2 | | X2 | | P2 | | 27.00 | F2 | | | | P2 | | 81.00 | E2 | |
| 40.00 | 31.50 | W3 | 2595.0 | X3 | 22.97 | P3 | 2265.0 | 21.50 | F3 | 356.0 | 15.72 | 361.01 | P3 | 2265.0 | 64.40 | E3 | 232.0 |
| 31.50 | 25.00 | W4 | 2265.0 | X4 | 20.05 | P4 | 2187.0 | 16.95 | F4 | 320.0 | 14.63 | 293.34 | P4 | - | - | E4 | 170.0 |
| 25.00 | 20.00 | W5 | 2147.0 | X5 | 19.00 | P5 | 1965.0 | 13.50 | F5 | 298.0 | 15.17 | 288.19 | P5 | 1965.0 | 40.50 | E5 | 160.0 |
| 20.00 | 16.00 | W6 | 1798.0 | X6 | 15.91 | P6 | 1658.0 | 10.80 | F6 | 170.0 | 10.25 | 163.17 | P6 | 1658.0 | 32.40 | E6 | 148.0 |
| 16.00 | 12.50 | W7 | 1265.0 | X7 | 11.20 | P7 | 1187.0 | 8.55 | F7 | 90.0 | 7.58 | 84.89 | P7 | 1187.0 | 25.60 | E7 | 132.0 |
| 12.50 | 10.00 | W8 | 965.0 | X8 | 8.54 | P8 | 740.0 | 6.75 | F8 | 75.0 | 10.14 | 86.57 | P8 | 740.0 | 20.20 | E8 | 165.0 |
| 10.00 | 6.30 | W9 | 263.0 | X9 | 2.33 | P9 | 235.0 | 4.89 | F9 | 60.0 | 25.53 | 59.43 | P9 | 235.0 | 14.70 | E9 | 95.0 |
| | | **Σ W** | **11298.0** | | | | | | | | | **ΣXY 1336.61** | **ΣP** | **8050.0** | | **ΣE** | **1102.0** |

Result : Flakiness Index = **13.37%**

Elongation Index = **13.69%**

Result : Combined Flakiness & Elongation index **27.06%**

Comments: Maximum Combined flakiness and Elongation indices value for Dense Graded Bituminous Macadam is 35%

Note:

→ The results indicated above are based on the tests carried out on the samples received in the laboratory.

For CIVIL EXPERTS

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## NABL ACCREDITED AS PER ISO/IEC 17025:2005

Job No.: CECTC-RRN-TP-2014-15 Date: 08.10.2014

### BITUMEN CONTENT AND GRADATION DETERMINATION OF DENSE GRADED BITUMINOUS MACADAM MIX
### AASHTO T 164 & AASHTO T 30

| | |
|---|---|
| Client | **Executive Engineer,** Road Infrastructure RajaRajeshwari Nagara Division, BBMP, Bangalore. |
| Agency | **Technical Manager, KRIDL, Bangalore.** |
| Name of the Work | Improvements to footpath & Asphalting to 3rd Cross, 8th Main, 9th Main, 10th Main Judicial Layout Allalasandra at Yelahanka Zone in Ward No.4 |
| Sample ID | Sample supplied by Agency |
| Date of Testing | 08.10.2014 |

**BITUMEN CONTENT DETERMINATION**

| Description | Trail 1 | Trail 2 |
|---|---|---|
| 1. Weight of Mixture before Test, g | 500 | 500 |
| 2. Weight of Mixture after Test, g | 475 | 475.5 |
| 3. Weight of Asphalt and Mineral matter Extracted, g | - | - |
| 4. Weight of Mineral Matter, g. | - | - |
| 5. Weight of Ash, g | | |
| 6. Weight of Bitumen Extracted, g. (corrected) | 25 | 24.50 |
| 7. Bitumen content in % | 5.00 | 4.90 |
| *8. Average* | **4.95** | |

**GRADATION AFTER EXTRACTION**

| SIEVE SIZE | Trail 1 | | | | JOBMIX |
|---|---|---|---|---|---|
| mm | Weight Retained, gm | Cummulative Weight Retained | %Cummulative Retained | % Passing | Gradation |
| 37.5 | 0 | 0 | 0 | 100 | 100 |
| 26.5 | 21.98 | 21.98 | 4.6 | 95.4 | 90 - 100 |
| 19 | 52.03 | 74.01 | 15.6 | 84.4 | 71 - 95 |
| 13.2 | 65.12 | 139.13 | 29.3 | 70.7 | 56 - 80 |
| 4.75 | 99.65 | 238.78 | 50.3 | 49.7 | 38 - 54 |
| 2.360 | 68.47 | 307.25 | 64.7 | 35.3 | 28 - 42 |
| 0.300 | 99.48 | 406.73 | 85.6 | 14.4 | 7 - 21 |
| 0.075 | 52.14 | 458.87 | 96.6 | 3.4 | 2 - 8 |

| SIEVE SIZE | Trail 2 | | | | JOBMIX |
|---|---|---|---|---|---|
| mm | Weight Retained, gm | Cummulative Weight Retained | %Cummulative Retained | % Passing | Gradation |
| 37.5 | 0 | 0 | 0 | 100 | 100 |
| 26.5 | 24.33 | 24.33 | 5.1 | 94.9 | 90 - 100 |
| 19 | 82.47 | 106.8 | 22.5 | 77.5 | 71 - 95 |
| 13.2 | 65.04 | 171.84 | 36.1 | 63.9 | 56 - 80 |
| 4.75 | 92.87 | 264.71 | 55.7 | 44.3 | 38 - 54 |
| 2.360 | 75.63 | 340.34 | 71.6 | 28.4 | 28 - 42 |
| 0.300 | 92.56 | 432.9 | 91.0 | 9.0 | 7 - 21 |
| 0.075 | 28.14 | 461.04 | 97.0 | 3.0 | 2 - 8 |

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# NABL ACCREDITED AS PER ISO/IEC 17025:2005

Job No.: CECTC-RRN-TP-2014-15 Date: 09.10.2014

## BITUMEN CONTENT AND GRADATION DETERMINATION OF DENSE GRADED BITUMINOUS MACADAM MIX
AASHTO T 164 & AASHTO T 30

| | |
|---|---|
| Client | **Executive Engineer,** Road Infrastructure RajaRajeshwari Nagara Division, BBMP, Bangalore. |
| Agency | **Technical Manager, KRIDL, Bangalore.** |
| Name of the Work | Improvements to footpath & Asphalting to 3rd Cross, 8th Main, 9th Main, 10th Main Judicial Layout Allalasandra at Yelahanka Zone in Ward No.4 |
| Sample ID | Sample supplied by Agency |
| Date of Testing | 09.10.2014 |

### BITUMEN CONTENT DETERMINATION

| Description | Trail 1 | Trail 2 |
|---|---|---|
| 1. Weight of Mixture before Test, g | 500 | 500 |
| 2. Weight of Mixture after Test, g | 476 | 475 |
| 3. Weight of Asphalt and Mineral matter Extracted, g | - | - |
| 4. Weight of Mineral Matter, g. | - | - |
| 5. Weight of Ash, g | | |
| 6. Weight of Bitumen Extracted, g. (corrected) | 24 | 25.00 |
| 7. Bitumen content in % | 4.80 | 5.00 |
| 8. Average | **4.90** | |

### GRADATION AFTER EXTRACTION

| SIEVE SIZE | Trail 1 | | | | JOBMIX |
|---|---|---|---|---|---|
| mm | Weight Retained, gm | Cummulative Weight Retained | %Cummulative Retained | % Passing | Gradation |
| 37.5 | 0 | 0 | 0 | 100 | 100 |
| 26.5 | 22.03 | 22.03 | 4.6 | 95.4 | 90 - 100 |
| 19 | 52.14 | 74.17 | 15.6 | 84.4 | 71 - 95 |
| 13.2 | 66.98 | 141.15 | 29.7 | 70.3 | 56 - 80 |
| 4.75 | 98.14 | 239.29 | 50.3 | 49.7 | 38 - 54 |
| 2.360 | 69.22 | 308.51 | 64.8 | 35.2 | 28 - 42 |
| 0.300 | 98.14 | 406.65 | 85.4 | 14.6 | 7 - 21 |
| 0.075 | 52.18 | 458.83 | 96.4 | 3.6 | 2 - 8 |

| SIEVE SIZE | Trail 2 | | | | JOBMIX |
|---|---|---|---|---|---|
| mm | Weight Retained, gm | Cummulative Weight Retained | %Cummulative Retained | % Passing | Gradation |
| 37.5 | 0 | 0 | 0 | 100 | 100 |
| 26.5 | 26.32 | 26.32 | 5.5 | 94.5 | 90 - 100 |
| 19 | 86.14 | 112.46 | 23.7 | 76.3 | 71 - 95 |
| 13.2 | 66.98 | 179.44 | 37.8 | 62.2 | 56 - 80 |
| 4.75 | 93.14 | 272.58 | 57.4 | 42.6 | 38 - 54 |
| 2.360 | 68.35 | 340.93 | 71.8 | 28.2 | 28 - 42 |
| 0.300 | 87.45 | 428.38 | 90.2 | 9.8 | 7 - 21 |
| 0.075 | 21.65 | 450.03 | 94.7 | 5.3 | 2 - 8 |

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## NABL ACCREDITED AS PER ISO/IEC 17025:2005

Job No.: CECTC-RRN-TP-2014-15 Date: 08.10.2014

### TEST REPORT ON STABILITY OF MIX

| | | |
|---|---|---|
| **Client** | : | **Executive Engineer,** Road Infrastructure RajaRajeshwari Nagara Division, BBMP, Bangalore. |
| **Agency** | : | **Technical Manager, KRIDL, Bangalore.** |
| **Name of the work** | : | Improvements to footpath & Asphalting to 3rd Cross, 8th Main, 9th Main, 10th Main Judicial Layout Allalasandra at Yelahanka Zone in Ward No.4 |
| **Source of location** | : | Hot mix Plant, Bangalore |
| **Type of Mix** | : | Dense Graded Bituminous Macadam |
| **Date of testing** | : | 08.10.2014 |

The results of the tests conducted on the Dense Graded Bituminous Macadam sample are as follows:

| Sl. No | Description | Test Result 1 | Test Result 2 | Requirement as per MORTH (Table 500-11) |
|---|---|---|---|---|
| 1 | Marshal Stability, Kn | 10.18 | 10.25 | 9 Kn (min) |
| 2 | Marshal flow, mm | 2.39 | 3.32 | 2 – 4 |
| 3 | Percent air voids in Mix | 4.85 | 4.20 | 3 – 5 |
| 4 | Percent voids in mineral aggregates | 12.32 | 11.48 | 11 - 13 |
| 5 | Percent voids filled with Bitumen | 73.65 | 72.12 | 65 – 75 |
| 6 | Density, g/cc | 2.25 | 2.27 | -- |

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Job No.: CECTC-RRN-TP-2014-15 Date: 09.10.2014

### TEST REPORT ON STABILITY OF MIX

| | | |
|---|---|---|
| **Client** | : | **Executive Engineer,** Road Infrastructure RajaRajeshwari Nagara Division, BBMP, Bangalore. |
| **Agency** | : | **Technical Manager, KRIDL, Bangalore.** |
| **Name of the work** | : | Improvements to footpath & Asphalting to 3rd Cross, 8th Main, 9th Main, 10th Main Judicial Layout Allalasandra at Yelahanka Zone in Ward No.4 |
| **Source of location** | : | Hot mix Plant, Bangalore |
| **Type of Mix** | : | Dense Graded Bituminous Macadam |
| **Date of testing** | : | 09.10.2014 |

The results of the tests conducted on the Dense Graded Bituminous Macadam sample are as follows:

| Sl. No | Description | Test Result 1 | Test Result 2 | Requirement as per MORTH (Table 500-11) |
|---|---|---|---|---|
| 1 | Marshal Stability, Kn | 10.23 | 10.28 | 9 Kn (min) |
| 2 | Marshal flow, mm | 2.27 | 3.12 | 2 – 4 |
| 3 | Percent air voids in Mix | 4.87 | 4.15 | 3 – 5 |
| 4 | Percent voids in mineral aggregates | 12.26 | 11.54 | 11 - 13 |
| 5 | Percent voids filled with Bitumen | 73.87 | 72.32 | 65 – 75 |
| 6 | Density, g/cc | 2.25 | 2.27 | -- |

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**NABL ACCREDITED AS PER ISO/IEC 17025:2005**

Job No.: CECTC-RRN-TP-2014-15 Date: 09.10.2014

## DETERMINATION OF RATE OF SPREAD TACK COAT

| | | |
|---|---|---|
| CLIENT | : | **Executive Engineer,** Road Infrastructure RajaRajeshwari Nagara Division, BBMP, Bangalore. |
| AGENCY | : | **Technical Manager, KRIDL, Bangalore.** |
| NAME OF THE WORK | : | Improvements to footpath & Asphalting to 3rd Cross, 8th Main, 9th Main, 10th Main Judicial Layout Allalasandra at Yelahanka Zone in Ward No.4 |
| DATE OF TESTING | : | 09.10.2014 |

**On Prime Coat**

| Determination | Unit | Test No | |
|---|---|---|---|
| | | 1 | 2 |
| Size of Plate (mxm) | mt | 0.45 X 0.45 | 0.45 X 0.45 |
| Area of Plate (a) | Sq.m | 0.2025 | 0.2025 |
| Intial Wt of empty Plate (b) | Kg | 1.625 | 1.627 |
| Final weight of plate after application of prime /Tack Coat ( c ) | Kg | 1.678 | 1.682 |
| Weight of Prime/Tack Coat (d=c-b) | Kg | 0.0530 | 0.0550 |
| Rate of spread of prime /tack coat | kg/Sq.m | 0.262 | 0.272 |
| Average | kg/Sq.m | 0.267 | |
| Specified Limit | kg/Sq.m | 0.25 Kg/sq.m | |

**Note:**

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Assistant Executive Engineer
Road Infrastructures
Rajarajeshwari Nagar Division
Bruhat Bangalore Mahanagara Palike

For CIVIL EXPERTS
Authorised Signatory

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## NABL ACCREDITED AS PER ISO/IEC 17025:2005

Job No.: CECTC-RRN-TP-2014-15
Date: 07.10.2014

### TEST REPORT

| | | |
|---|---|---|
| **Client** | : | **Executive Engineer,** Road Infrastructure RajaRajeshwari Nagara Division, BBMP, Bangalore. |
| **Agency** | : | **Technical Manager, KRIDL, Bangalore.** |
| **Name of the work** | : | Improvements to footpath & Asphalting to 3rd Cross, 8th Main, 9th Main, 10th Main Judicial Layout Allalasandra at Yelahanka Zone in Ward No.4 |
| **Source of location** | : | Hot mix Plant, Bangalore |
| **Date of testing** | : | 07.10.2014 |

The results of the tests conducted on the bitumen sample using for Bituminous Concrete

| Sl. No | Description | Test Result | Requirement as per IS:73:2006 |
|---|---|---|---|
| 1 | Penetration at 25 $^0$C, 1/10 mm | 66 | 60 to 70 |
| 2 | Softening point, $^0$C | 52 | Min. 45 |
| 3 | Ductility at 27$^0$C, cm | 100 > | Min. 50 |
| 4 | Flash Point, $^0$C | 326 | Min. 220 |

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## NABL ACCREDITED AS PER ISO/IEC 17025:2005

Job No.: CECTC-RRN-TP-2014-15 Date: 08.10.2014

## TEST REPORT

| | | |
|---|---|---|
| **Client** | : | **Executive Engineer,** Road Infrastructure RajaRajeshwari Nagara Division, BBMP, Bangalore. |
| **Agency** | : | **Technical Manager, KRIDL, Bangalore.** |
| **Name of the work** | : | Improvements to footpath & Asphalting to 3rd Cross, 8th Main, 9th Main, 10th Main Judicial Layout Allalasandra at Yelahanka Zone in Ward No.4 |
| **Source of location** | : | Hot mix Plant, Bangalore |
| **Date of testing** | : | 08.10.2014 |

The results of the tests conducted on the bitumen sample using for Bituminous Concrete

| Sl. No | Description | Test Result | Requirement as per IS:73:2006 |
|---|---|---|---|
| 1 | Penetration at 25 $^0$C, 1/10 mm | 69 | 60 to 70 |
| 2 | Softening point, $^0$C | 51 | Min. 45 |
| 3 | Ductility at 27$^0$C, cm | 100 > | Min. 50 |
| 4 | Flash Point, $^0$C | 318 | Min. 220 |

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## NABL ACCREDITED AS PER ISO/IEC 17025:2005

Job No.: CECTC-RRN-TP-2014-15 Date: 07.10.2014

### Aggregate Impact Value

IS: 2386 Part IV

| | |
|---|---|
| **Client** | **Executive Engineer,** Road Infrastructure RajaRajeshwari Nagara Division, BBMP, Bangalore. |
| **Agency** | **Technical Manager, KRIDL, Bangalore.** |
| **Name of the Work** | Improvements to footpath & Asphalting to 3rd Cross, 8th Main, 9th Main, 10th Main Judicial Layout Allalasandra at Yelahanka Zone in Ward No.4 |
| **Source / Location** | Hot Mix Plant, Bangalore |
| **Type of Mix** | Bituminous Concrete |
| **Date of Testing** | 07.10.2014 |

| Sl No. | Details | Trial No. | | Average |
|---|---|---|---|---|
| | | 1 | 2 | |
| 1 | Total weight of aggregate sample filling the cylindrical measure = $W_1$ g | 378 | 381 | |
| 2 | Weight of agregate passing 2.36 mm sieve after the test = $W_2$ g | 87 | 83 | |
| 3 | Weight of aggregate retained 2.36 mm sieve after the test = $W_3$ g | 291 | 298 | |
| 4 | Aggregate Impact value = percent fines<br>100* ($W_2/W_1$) percent | 23.02 | 21.78 | **22.40** |

Comments:

→ Maximum allowable Aggregate Impact value for Bituminous Concrete is 24%

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## NABL ACCREDITED AS PER ISO/IEC 17025:2005

Job No.: CECTC-RRN-TP-2014-15 Date: 08.10.2014

### Aggregate Impact Value

IS: 2386 Part IV

| | |
|---|---|
| **Client** | **Executive Engineer,** Road Infrastructure RajaRajeshwari Nagara Division, BBMP, Bangalore. |
| **Agency** | **Technical Manager, KRIDL, Bangalore.** |
| **Name of the Work** | Improvements to footpath & Asphalting to 3rd Cross, 8th Main, 9th Main, 10th Main Judicial Layout Allalasandra at Yelahanka Zone in Ward No.4 |
| **Source / Location** | Hot Mix Plant, Bangalore |
| **Type of Mix** | Bituminous Concrete |
| **Date of Testing** | 08.10.2014 |

| Sl No. | Details | Trial No. | | Average |
|---|---|---|---|---|
| | | 1 | 2 | |
| 1 | Total weight of aggregate sample filling the cylindrical measure = $W_1$ g | 382 | 377 | |
| 2 | Weight of agregate passing 2.36 mm sieve after the test = $W_2$ g | 84 | 88 | |
| 3 | Weight of aggregate retained 2.36 mm sieve after the test = $W_3$ g | 298 | 289 | |
| 4 | Aggregate Impact value = percent fines<br>100* ($W_2/W_1$) percent | 21.99 | 23.34 | **22.67** |

Comments:

→ Maximum allowable Aggregate Impact value for Bituminous Concrete is 24%

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Authorised Signatory

# CIVIL EXPERTS CONSULTANTS AND TESTING CENTER

Job No.: CECTC-RRN-TP-2014-15 Date : 07.10.2014

## DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

Client : **Executive Engineer,** Road Infrastructure RajaRajeshwari Nagara Division, BBMP, Bangalore.

Agency : **Technical Manager, KRIDL, Bangalore.**

Name of Work : Improvements to footpath & Asphalting to 3rd Cross, 8th Main, 9th Main, 10th Main Judicial Layout Allalasandra at Yelahanka Zone in Ward No.4

Technical Reference : IS 2386(Part 1) 1963 (RA 2007)

Type of Mix : Bituminous Concrete

Date of Testing : 07.10.2014

| Passing through IS Sieve, mm | Retained On IS Sieve, mm | Weight of Sieved Fraction (W) gms | | Proportion of Size range in the sample, X = 100xW/ΣW | | Weight of 200 pieces of aggregates of the range, (P) in gms | | Thickness gauge size, mm | Weight of flaky particles (F)in gms | | Percentage by Weight of flaky aggregates in gms Y= 100xF/P | Weighed Percentage of flaky aggregates in gms XY=X × Y | Weight of fraction consisting of at least 200 Pieces in gms | | Length gauge size in mm | Weight of aggregates in each fraction retained on Length gauge in gms | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 63.00 | 50.00 | W1 | | X1 | | P1 | | 33.90 | F1 | | | | P1 | | - | E1 | |
| 50.00 | 40.00 | W2 | | X2 | | P2 | | 27.00 | F2 | | | | P2 | | 81.00 | E2 | |
| 40.00 | 31.50 | W3 | | X3 | | P3 | | 21.50 | F3 | | | | P3 | | 64.40 | E3 | |
| 31.50 | 25.00 | W4 | | X4 | | P4 | | 16.95 | F4 | | | | P4 | - | - | E4 | - |
| 25.00 | 20.00 | W5 | | X5 | | P5 | | 13.50 | F5 | | | | P5 | | | E5 | |
| 20.00 | 16.00 | W6 | 1620 | X6 | 36.45 | P6 | 1465 | 10.80 | F6 | 211 | 14.40 | 525.03 | P6 | 1465.0 | 32.40 | E6 | 196 |
| 16.00 | 12.50 | W7 | 1487 | X7 | 33.46 | P7 | 1298 | 8.55 | F7 | 145 | 11.17 | 373.79 | P7 | 1298.0 | 25.60 | E7 | 120 |
| 12.50 | 10.00 | W8 | 932 | X8 | 20.97 | P8 | 830 | 6.75 | F8 | 96 | 11.57 | 242.57 | P8 | 830.0 | 20.20 | E8 | 98 |
| 10.00 | 6.30 | W9 | 405 | X9 | 9.11 | P9 | 287 | 4.89 | F9 | 80 | 27.87 | 254.03 | P9 | 287.0 | 14.70 | E9 | 48 |
| | | **Σ W** | **4444.0** | | | | | | | | | **ΣXY 1395.43** | **ΣP** | **3880.0** | | **ΣE** | **462.0** |

Result : Flakiness Index = **13.95%**

Elongation Index = **11.91%**

Result : Combined Flakiness & Elongation index **25.86%**

Comments: Maximum Allowable Combined flakiness and Elongation indices 35%

Note:

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## NABL ACCREDITED AS PER ISO/IEC 17025:2005

Job No.: CECTC-RRN-TP-2014-15 Date: 10.10.2014

### BITUMEN CONTENT AND GRADATION DETERMINATION OF BITUMINOUS CONCRETE AASHTO T 164 & AASHTO T 30

| | |
|---|---|
| CLIENT | **Executive Engineer,** Road Infrastructure RajaRajeshwari Nagara Division, BBMP, Bangalore. |
| AGENCY | **Technical Manager, KRIDL, Bangalore.** |
| NAME OF THE WORK | Improvements to footpath & Asphalting to 3rd Cross, 8th Main, 9th Main, 10th Main Judicial Layout Allalasandra at Yelahanka Zone in Ward No.4 |
| SAMPLE I/D | Sample Supplied by Agency |
| DATE OF TESTING | 10.10.2014 |

**BITUMEN CONTENT DETERMINATION**

| Description | Sample 1 | Sample 2 |
|---|---|---|
| 1. Weight of Mixture before Test, g | 500 | 500 |
| 2. Weight of Mixture after Test, g | 475 | 472 |
| 3. Weight of Asphalt and Mineral matter Extracted, g | 25 | 28 |
| 4. Weight of Mineral Matter, g. | - | - |
| 5. Weight of Ash, g | - | - |
| 6. Weight of Bitumen Extracted, g. (corrected) | 25 | 28 |
| 7. Bitumen content in % | 5.00 | 5.60 |
| 8. Average | **5.30** | |

**GRADATION AFTER EXTRACTION**

**TABLE - 1**

| SIEVE SIZE | Percent Passing, % | | JOBMIX |
|---|---|---|---|
| mm | Sample 1 | Sample 2 | Gradation |
| 19 | 100.00 | 100.00 | 100 |
| 13.2 | 92.16 | 91.48 | 79-100 |
| 9.5 | 83.65 | 82.14 | 70-88 |
| 4.75 | 62.14 | 63.24 | 53-71 |
| 2.36 | 55.12 | 55.47 | 42-58 |
| 1.18 | 45.87 | 46.18 | 34-48 |
| 0.6 | 33.15 | 33.25 | 26-38 |
| 0.3 | 23.14 | 25.47 | 18-28 |
| 0.15 | 15.98 | 16.98 | 12-20 |
| 0.075 | 8.22 | 8.65 | 4-10 |

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## NABL ACCREDITED AS PER ISO/IEC 17025:2005

Job No.: CECTC-RRN-TP-2014-15 Date: 11.10.2014

### BITUMEN CONTENT AND GRADATION DETERMINATION OF BITUMINOUS CONCRETE AASHTO T 164 & AASHTO T 30

| | |
|---|---|
| CLIENT | **Executive Engineer,** Road Infrastructure RajaRajeshwari Nagara Division, BBMP, Bangalore. |
| AGENCY | **Technical Manager, KRIDL, Bangalore.** |
| NAME OF THE WORK | Improvements to footpath & Asphalting to 3rd Cross, 8th Main, 9th Main, 10th Main Judicial Layout Allalasandra at Yelahanka Zone in Ward No.4 |
| SAMPLE I/D | Sample Supplied by Agency |
| DATE OF TESTING | 11.10.2014 |

**BITUMEN CONTENT DETERMINATION**

| Description | Sample 1 | Sample 2 |
|---|---|---|
| 1. Weight of Mixture before Test, g | 500 | 500 |
| 2. Weight of Mixture after Test, g | 477 | 471 |
| 3. Weight of Asphalt and Mineral matter Extracted, g | 23 | 29 |
| 4. Weight of Mineral Matter, g. | - | - |
| 5. Weight of Ash, g | - | - |
| 6. Weight of Bitumen Extracted, g. (corrected) | 23 | 29 |
| 7. Bitumen content in % | 4.60 | 5.80 |
| 8. Average | **5.20** | |

**GRADATION AFTER EXTRACTION**

**TABLE - 1**

| SIEVE SIZE | Percent Passing, % | | JOBMIX |
|---|---|---|---|
| mm | Sample 1 | Sample 2 | Gradation |
| 19 | 100.00 | 100.00 | 100 |
| 13.2 | 91.65 | 90.98 | 79-100 |
| 9.5 | 82.49 | 81.24 | 70-88 |
| 4.75 | 61.24 | 60.45 | 53-71 |
| 2.36 | 56.24 | 55.69 | 42-58 |
| 1.18 | 43.14 | 42.00 | 34-48 |
| 0.6 | 32.98 | 29.15 | 26-38 |
| 0.3 | 22.54 | 18.36 | 18-28 |
| 0.15 | 19.25 | 16.25 | 12-20 |
| 0.075 | 7.65 | 6.02 | 4-10 |

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## NABL ACCREDITED AS PER ISO/IEC 17025:2005

Job No.: CECTC-RRN-TP-2014-15 Date: 12.10.2014

### BITUMEN CONTENT AND GRADATION DETERMINATION OF BITUMINOUS CONCRETE AASHTO T 164 & AASHTO T 30

| | |
|---|---|
| CLIENT | **Executive Engineer,** Road Infrastructure RajaRajeshwari Nagara Division, BBMP, Bangalore. |
| AGENCY | **Technical Manager, KRIDL, Bangalore.** |
| NAME OF THE WORK | Improvements to footpath & Asphalting to 3rd Cross, 8th Main, 9th Main, 10th Main Judicial Layout Allalasandra at Yelahanka Zone in Ward No.4 |
| SAMPLE I/D | Sample Supplied by Agency |
| DATE OF TESTING | 12.10.2014 |

**BITUMEN CONTENT DETERMINATION**

| Description | Sample 1 | Sample 2 |
|---|---|---|
| 1. Weight of Mixture before Test, g | 500 | 500 |
| 2. Weight of Mixture after Test, g | 473.5 | 473 |
| 3. Weight of Asphalt and Mineral matter Extracted, g | 26.5 | 27 |
| 4. Weight of Mineral Matter, g. | - | - |
| 5. Weight of Ash, g | - | - |
| 6. Weight of Bitumen Extracted, g. (corrected) | 26.5 | 27 |
| 7. Bitumen content in % | 5.30 | 5.80 |
| 8. Average | **5.55** | |

**GRADATION AFTER EXTRACTION**

**TABLE - 1**

| SIEVE SIZE | Percent Passing, % | | JOBMIX |
|---|---|---|---|
| mm | Sample 1 | Sample 2 | Gradation |
| 19 | 100.00 | 100.00 | 100 |
| 13.2 | 90.78 | 91.57 | 79-100 |
| 9.5 | 83.65 | 81.24 | 70-88 |
| 4.75 | 61.47 | 62.35 | 53-71 |
| 2.36 | 55.65 | 55.47 | 42-58 |
| 1.18 | 43.58 | 45.28 | 34-48 |
| 0.6 | 29.68 | 29.65 | 26-38 |
| 0.3 | 23.47 | 21.54 | 18-28 |
| 0.15 | 19.56 | 18.65 | 12-20 |
| 0.075 | 7.25 | 6.25 | 4-10 |

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